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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 124184/55 LV	FOR FURTHER ACTION	See Form PCT/IPEA/416
International application No. PCT/NZ2004/000259	International filing date (<i>day/month/year</i>) 15 October 2004	Priority date (<i>day/month/year</i>) 21 October 2003
International Patent Classification (IPC) or national classification and IPC Int. Cl. ⁷ A01J 11/02, 11/04; B01D 19/02		
Applicant ELIMINATOR HOLDINGS LIMITED et al		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 3 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
 - a. ☒ (*sent to the applicant and to the International Bureau*) a total of 12 sheets, as follows:

☒ sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).

☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
 - b. ☐ (*sent to the International Bureau only*) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or table related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

☒ Box No. I Basis of the report
☐ Box No. II Priority
☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐ Box No. IV Lack of unity of invention
☒ Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐ Box No. VI Certain documents cited
☐ Box No. VII Certain defects in the international application
☐ Box No. VIII Certain observations on the international application

Date of submission of the demand 19 May 2005	Date of completion of the report 10 October 2005
Name and mailing address of the IPEA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaaustralia.gov.au Facsimile No. (02) 6285 3929	Authorized Officer D.R. LUM Telephone No. (02) 6283 2544

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/NZ2004/000259

Box No. I Basis of the report

1. With regard to the language, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ This report is based on translations from the original language into the following language which is the language of a translation furnished for the purposes of:

☐ international search (under Rules 12.3 and 23.1 (b)).

☐ publication of the international application (under Rule 12.4)

☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the elements of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

☐ the international application as originally filed/furnished

☒ the description:

pages as originally filed/furnished

pages* 1-9 received by this Authority on 23 May 2005 with the letter of 19 May 2005

pages* received by this Authority on with the letter of

☒ the claims:

pages as originally filed/furnished

pages* as amended (together with any statement) under Article 19

pages* 10-12 received by this Authority on 23 May 2005 with the letter of 19 May 2005

pages* received by this Authority on with the letter of

☒ the drawings:

pages 1/1 as originally filed/furnished

pages* received by this Authority on with the letter of

pages* received by this Authority on with the letter of

☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages

☐ the claims, Nos.

☐ the drawings, sheets/figs

☐ the sequence listing (*specify*):

☐ any table(s) related to the sequence listing (*specify*):

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

☐ the description, pages

☐ the claims, Nos.

☐ the drawings, sheets/figs

☐ the sequence listing (*specify*):

☐ any table(s) related to the sequence listing (*specify*):

* If item 4 applies, some or all of those sheets may be marked "superseded."

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/NZ2004/000259**Box No. V** Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**1. Statement**

Novelty (N)	Claims 1-16	YES
	Claims	NO
Inventive step (IS)	Claims 1-16	YES
	Claims	NO
Industrial applicability (IA)	Claims 1-16	YES
	Claims	NO

2. Citations and explanations (Rule 70.7)

Claims 1-16 meet the criteria set forth in PCT Article 33(2) – (4) for novelty, inventive step and industrial applicability. The prior art, individually or in obvious combination, published before the priority date does not disclose the features of the independent claims 1 or 7.

ANTI-FOAMING DEVICE

TECHNICAL FIELD

This invention relates to an anti-foaming device.

In particular, this invention relates to an anti-foaming device for the use in
5 animal husbandry where the milking of an animal and the subsequent storage of
that milk is required.

Reference throughout the specification shall now be made to use of the present
invention in relation to the control of foaming in milk.

However, this should not be seen to be a limitation on the present invention in
10 any way as it may be used with any other fluid where foaming can occur under
certain temperature and pressure conditions.

BACKGROUND ART

The use of fluid treatment systems within the dairy industry is well known,
particularly for the collection and storing of milk from a herd of animals.

15 Historically milk was manually extracted from animals. Milk was generally
collected into a pail before being transferred to some form of holding tank prior
to its disposal.

The advent of electro-mechanical milking equipment not only greatly improved
the sanitation of the old system, it also improved the yield considerably.

20 Another improvement with the electro-mechanical system is that the operator
could milk more than one animal at a time.

The milk extracted from the animals was done so under a "system vacuum" (this reduced the gas pressure within the milkline connected to the teat in order to extract the milk from the teat).

Due to the nature of both manual and electro-mechanical extraction of milk from
5 an animal a volume of gas becomes entrained within the milk prior to the milk entering a bulk storage tank.

Although the electro-mechanical milking systems overcome most of the problems associated with the previous manual milking method they do not overcome the problems associated with the introduction of entrained gas into
10 the product.

An extremely significant problem caused by the introduction of gas is that under certain seasonal temperature conditions foaming of the milk will be more prevalent.

Another drawback of the presence of entrained gas is that a greater volume is
15 needed to store the product as the gas increases the overall volume of the product.

This also introduces a further drawback for the farmer in that when tested the milk indicates that it has a lower milk solids content per litre due to the presence of the entrained gas.

20 A further drawback with the introduction of gas into the product is that it can encourage the proliferation of aerobic bacteria developing within the milk.

The improved fluid treatment system disclosed in New Zealand Patent Application No. 528893 overcomes all the aforementioned problems apart from

the foaming of the milk under certain seasonal temperature conditions.

All references, including any patents or patent applications cited in this specification are hereby incorporated by reference. No admission is made that any reference constitutes prior art. The discussion of the references states
5 what their authors assert, and the applicants reserve the right to challenge the accuracy and pertinency of the cited documents. It will be clearly understood that, although a number of prior art publications are referred to herein, this reference does not constitute an admission that any of these documents form part of the common general knowledge in the art, in New Zealand or in any
10 other country.

It is acknowledged that the term 'comprise' may, under varying jurisdictions, be attributed with either an exclusive or an inclusive meaning. For the purpose of this specification, and unless otherwise noted, the term 'comprise' shall have an inclusive meaning - i.e. that it will be taken to mean an inclusion of not only the
15 listed components it directly references, but also other non-specified components or elements. This rationale will also be used when the term 'comprised' or 'comprising' is used in relation to one or more steps in a method or process.

It is an object of the present invention to address the foregoing problems or at
20 least to provide the public with a useful choice.

Further aspects and advantages of the present invention will become apparent from the ensuing description which is given by way of example only.

DISCLOSURE OF INVENTION

According to one aspect of the present invention there is provided an anti-foaming device, configured to reducing foaming of a fluid within a fluid treatment system, the device including,

- 5 a conduit, wherein the conduit is in contact with at least a part of the exterior surface of the fluid treatment system, and

a thermally conductive media, wherein the media is passed through the conduit, and

a heat transfer device,

- 10 characterised in that,

the heat transfer device is configured to control the temperature of the media within the conduit to hold the temperature of the fluid within the fluid treatment system above or below a foaming temperature.

- Throughout the present specification the fluid should now be referred to as
15 being milk however this should not be seen to be a limitation on the present invention as it is equally feasible for the present invention to be used with any other fluid that is prevalent to foaming under certain temperature and pressure conditions.

- Throughout the present specification the media shall now be referred to as
20 being water in the form of an ice slurry however this also should not be seen to be a limitation on the present invention as the media can be any flowable material, or combination of materials, capable of altering the temperature of the fluid within the fluid treatment system to a position outside the range at which it

can foam.

For example, in some embodiments the media could be pure liquid water, refrigerant gas or glycol.

5 In preferred embodiments of the present invention the water is pumped through the conduit to ensure an adequate flowrate of the water is achieved for an adequate level of heat transfer to occur between the water and the milk.

It should be appreciated that while it is envisaged that in most embodiments of the present invention the fluid will be cooled, it is possible that in other embodiments the fluid could be heated so that it is taken above the temperature
10 at which foam would normally occur. Thus, the reference to cooling should not be seen as limiting.

However, it should be appreciated that in the dairy industry it is usually desirable to cool milk as quickly as possible for a number of reasons including improving the microbiological quality of the milk and possible reduction in fat damage
15 caused by pumping.

It should be appreciated that the present invention not only provides a mean to prevent foaming in a fluid, but it also provides an effective method by which fluid, and in particular milk can be chilled rapidly. These dual benefits of the present invention are very desirable for the dairy industry.

20 It should also be appreciated that in preferred embodiments of the present invention the conduit is constructed as a spiral jacket. The spiral jacket is preferably fitted around the external surface of the fluid treatment system. Most likely the spiral jacket is held within an external skin. Preferably the construction and the fitting of the jacket and the fitting of it in relation to the fluid treatment

system ensures there is adequate water flow throughout the conduit sufficient to eliminate any dead-spots where the water flow rate is insufficient to adequately control the temperature of the milk.

5 In some embodiments of the present invention the external surface of the fluid treatment system may be textured. This can present a greater surface area which is exposed to the cooling jacket as a consequence. This enables greater amount of heat transfer between the fluid held within the treatment system and the jacket.

10 This should not however be seen to be a limitation on the present invention in any way as in other embodiments the conduit can be formed in other configurations than as a spiral and may even be constructed simply as an outer skin wherein the water flows between the outer skin and the fluid treatment system wall.

15 In preferred embodiments of the present invention the fluid treatment system should be understood to be at least part of the invention disclosed in New Zealand Patent Application No. 528893 and in particular the secondary chamber thereof.

20 This should not however be seen to be a limitation on the present invention in any way as in other embodiments the fluid treatment system can be other means for holding a volume of fluid, an example of which would be a standard milk reservoir, for example a receiving can.

The foaming of milk only occurs over a relatively small temperature range for any given pressure, therefore if the pressure at which the milk is held is known then the calculation at which temperature the milk is likely to foam would be

quite straightforward.

In conventional milking systems foaming of the milk can occur in milk lines as well as in the milk reservoir at certain times of the year.

This is due to seasonal temperature variations causing the temperature of the
5 milk to reach the point at which foaming occurs.

This drawback is equally true for the device disclosed in New Zealand Patent Application No. 528893 although it should be noted that due to the thin film of milk on the surface of the secondary chamber the heat transfer of the milk will be far faster and more efficient due to the increased contact area for heat
10 transfer.

Thus, the present invention particularly when combined with the device described above provides a rapid chilling/cooling device with a synergistic effect occurring through the use of the jacket and the increased surface area/low pressure provided by the fluid treatment system.

15 It should also be noted that use of the present invention increases removal of entrained gas from within the milk as well as removing most of the natural vapours from within the milk and thereby further improving the organoleptics of the milk.

Another advantage of the present invention is that the water exiting the present
20 invention can be used for other applications (such as teat washing) as in most applications cooling of the milk will be required and therefore the exit water will have an increased temperature.

The exit water from the present invention can be used for other applications,

examples of which would be cleaning down the equipment or the milking area.

From the foregoing it is clear that the present invention has a significant advantage over all the conventional milking systems available and can provide the farmer and hence the consumer with a consistent and sweet smelling product throughout the year and which is unaffected by any seasonal temperature variations.

BRIEF DESCRIPTION OF DRAWINGS

Further aspects of the present invention will become apparent from the following description which is given by way of example only and with reference to the accompanying drawings in which:

Figure 1 is a diagrammatical representation of a sectional view of the present invention cut through its vertical mid-line.

BEST MODES FOR CARRYING OUT THE INVENTION

With reference to the figure there is illustrated an anti-foaming device generally indicated by arrow 1.

The anti-foaming device (1) is shown fitted to the improved fluid treatment system (disclosed in New Zealand Patent Application No. 528893).

It should be appreciated that this configuration is the most efficient shape for the present invention as with the secondary chamber (3) having a vertically conical side wall (4), a thin film laminar flow is formed on at least part of its surface – which ensures a heat transfer between the milk contained within the secondary chamber (3) and the water flowing within the present invention (1) can take place quickly and effectively.

The anti-foaming device (1) is formed as a set of coils (5) fitted to the outside of the secondary chamber (3) of the improved fluid treatment system (2,3) in order that water pumped through the coils (5) achieves a good level of heat transfer, through the wall (4) of the secondary chamber (3), with the milk.

- 5 The coils are actually fitted within an external skin. This means that the outside of the anti-foaming device in preferred embodiments is substantially planar.

Water enters the anti-foaming device (1) at the water inlet (7) and circulates around the coils (5) until it leaves the coils at the water outlet (6).

- 10 The water is maintained at a temperature below the foaming temperature of the milk within the fluid treatment system with a heat transfer device, to prevent foaming of the milk within the fluid treatment system.

The water can then be reused throughout the farm as required, or may be, treated and recycled within the process or may simply be disposed of.

Aspects of the present invention have been described by way of example only and it should be appreciated that modifications and additions may be made thereto without departing from the scope of the appended claims.

WHAT I/WE CLAIM IS:

1. An anti-foaming device configured to fit a fluid treatment system, and configured to reduce foaming of a fluid within the fluid treatment system, the device including,

a conduit wherein the conduit is in contact with at least a part of the exterior surface of the fluid treatment system,

a thermally conductive media wherein the media is passed through the conduit, and

a heat transfer device,

characterised in that

the heat transfer device is configured to control the temperature of the media within the conduit to hold the temperature of the fluid within the fluid treatment system above or below a foaming temperature.
2. An anti-foaming device as claimed in claim 1 wherein the fluid to be treated is milk.
3. An anti-foaming device as claimed in either claim 1 or claim 2 wherein the media is water.
4. An anti-foaming device as claimed in any one of claims 1 to 3 wherein the conduit is configured in the form of a spiral jacket.
5. An anti-foaming device as claimed in claim 4 wherein the spiral jacket is fitted around the external surface of the fluid treatment system.

6. An anti-foaming device as claimed in any one of claims 1 to 5 wherein the conduit is fitted to ensure that adequate media flow throughout the conduit is sufficient to eliminate any dead spots where the media flow rate is insufficient to adequately control the temperature of the fluid.
7. A method of reducing foaming of a fluid within a fluid treatment system characterised by operating an anti-foaming device which includes

a conduit wherein the conduit is in contact with at least a part of the exterior surface of the fluid treatment system,

a thermally conductive media wherein the media is passed through the conduit,

and

a heat transfer device,

characterised by the steps of:

a). introducing a fluid to the fluid treatment system, and

b). controlling the temperature of the media within the conduit with the heat transfer device to hold the temperature of the fluid above or below a foaming temperature.
8. A method as claimed in claim 7 wherein the fluid is milk.
9. A method as claimed in claim 7 or claim 8 wherein the media is water.
10. A method as claimed in any one of claims 7 to 9 wherein the conduit is configured in the form of a spiral jacket.

11. A method as claimed in claim 10 wherein the spiral jacket is fitted around the external surface of the fluid treatment system.
12. A method as claimed in any one of claims 7 to 11 wherein the conduit is fitted to ensure that adequate media flow throughout the conduit is sufficient to eliminate any dead spots where the media flow rate is insufficient to adequately control the temperature of the fluid.
13. A method of chilling a fluid characterised by operating an anti-foaming device as claimed in any one of claims 1 to 6.

characterised by the steps of:
 - a). introducing a fluid to the fluid treatment system, and
 - b). controlling the temperature of the media within the conduit with the heat transfer device to hold the temperature of the fluid above or below a foaming temperature.
14. An anti-foaming device substantially as herein described with reference to and as illustrated by the accompanying drawings.
15. A method of operating an anti-foaming device substantially as herein described with reference to and as illustrated by the accompanying drawings.
16. A method of chilling a fluid substantially as herein described with reference to and as illustrated by the accompanying drawings.